

# Cape Cod Bay Mapping Project: Mapping the shallow waters in Cape Cod Bay, Massachusetts



06 May 2010  
HSRP Public Meeting



# Outline

- Project
  - Equipment
- Field Setting
- Preliminary Results
- Research Goals



# Background

- Ready, Aim, Shoot self in foot
- Seafloor Mapping Cooperative (2003)
  - MCZM, USGS, NOAA.... PCCS
  - Bathy, surficial geo in MA waters (3 nm)
    - geophysical techniques, sed sampling, photos, video
  - 2003-08 1375 km<sup>2</sup> (530 mi<sup>2</sup>) mapped
    - Water depths 5-90 m

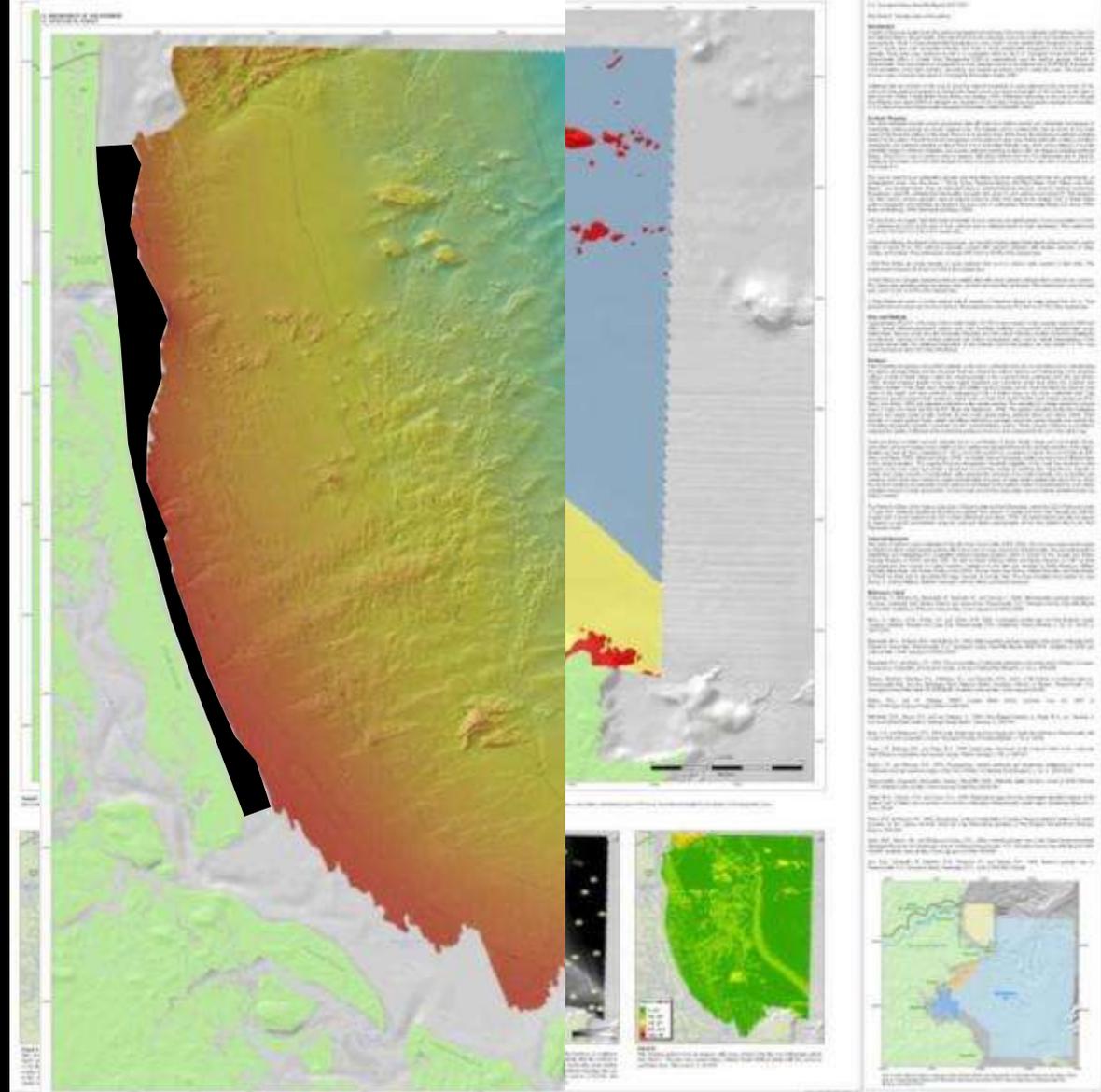


# Project Outline

- Develop methods to collect data, produce maps
  - Marine/Terrestrial Interface
  - Very shallow waters (<10m) to the beach/dune system
  - ‘Tide-coincident’
- Interferometric Sonar System



# USGS Data Products



the  
ce



# Provincetown Center for Coastal Studies



CAPE  
COD  
BAY

GULF OF MAINE

[www.flashearth.com](http://www.flashearth.com)

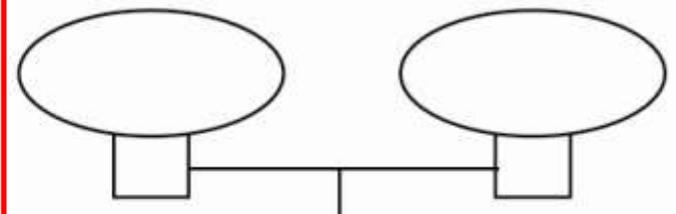


# Provincetown Center for Coastal Studies

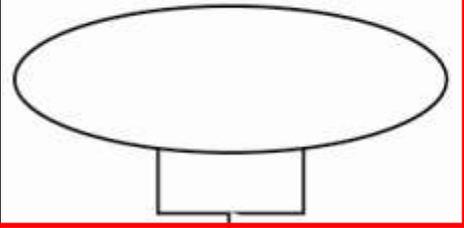




Vector Sensor  
Heading (Yaw)



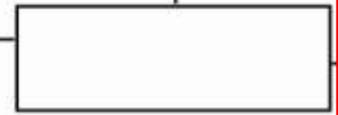
RTK-GPS  
Positioning and Tides



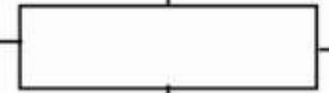
Motion Reference Unit  
Heave, Pitch, Roll



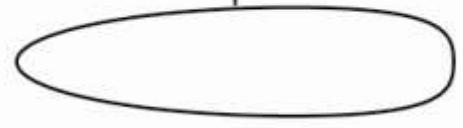
Vessel-Based  
Desktop Computer



Computer  
Converts sonar  
data to digital  
data



Sonar unit



CTD sensor



 Station connected  
Tracking 5 or more satellites.

 Station connected  
Tracking less than 5 satellites.

 Station disconnected  
Tracking 0 satellites.



**Map** | Satellite | Hybrid | Terrain

**Number of Bases:** 159  
**Current Base:** PTCS  
**Cursor Lat/Long:**  
42.06152862, -70.19714355

**Three Nearest Bases**

PTCS	1.26 km
KP10	45.86 km
KPI9	58.15 km

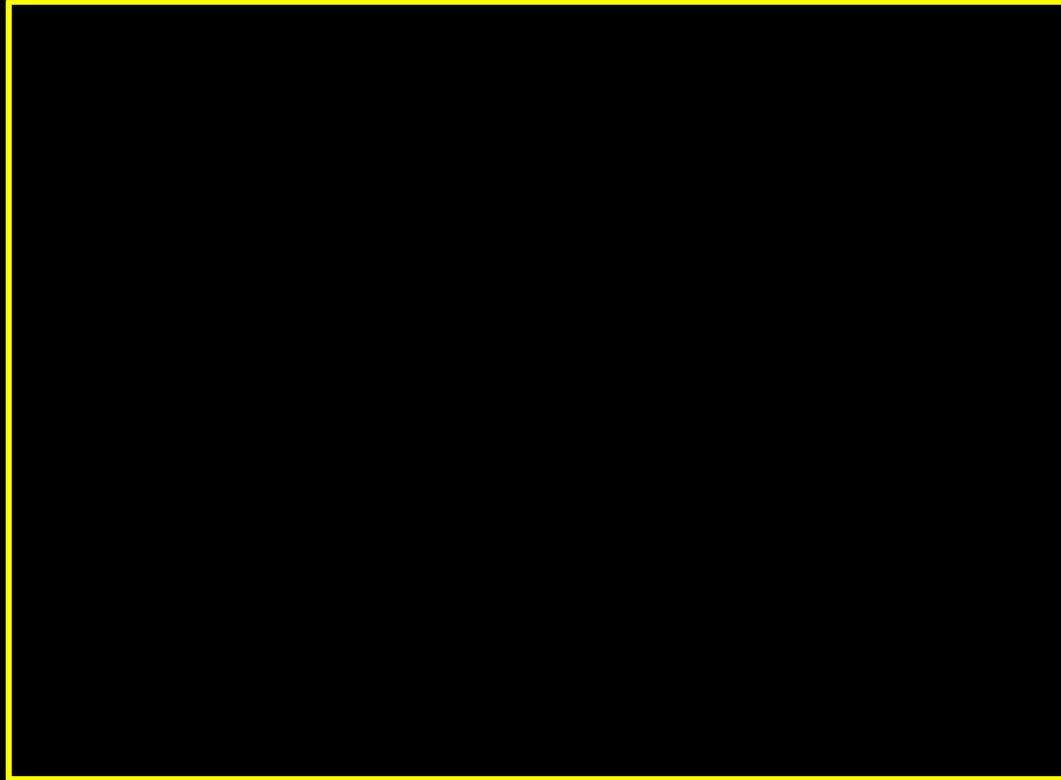
Type an address

POWERED BY 

Map data ©2010 Google - [Terms of Use](#)



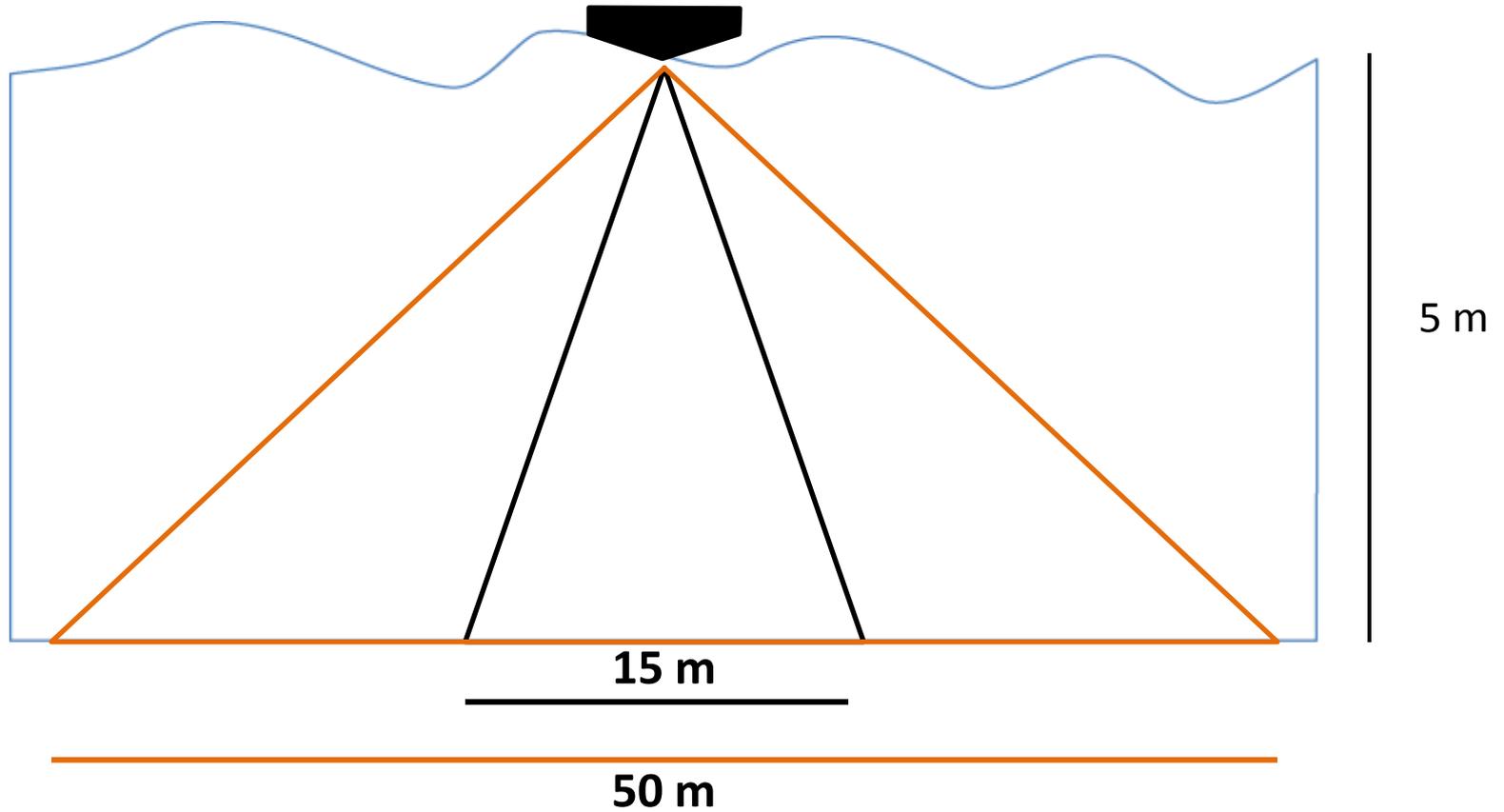
# Data Collection: Swath bathymetry, side scan imagery



Video downloaded from <http://oceanexplorer.noaa.gov>



# Interferometric vs. Multi-beam: Swath Width to Depth Ratio



# Field Setting

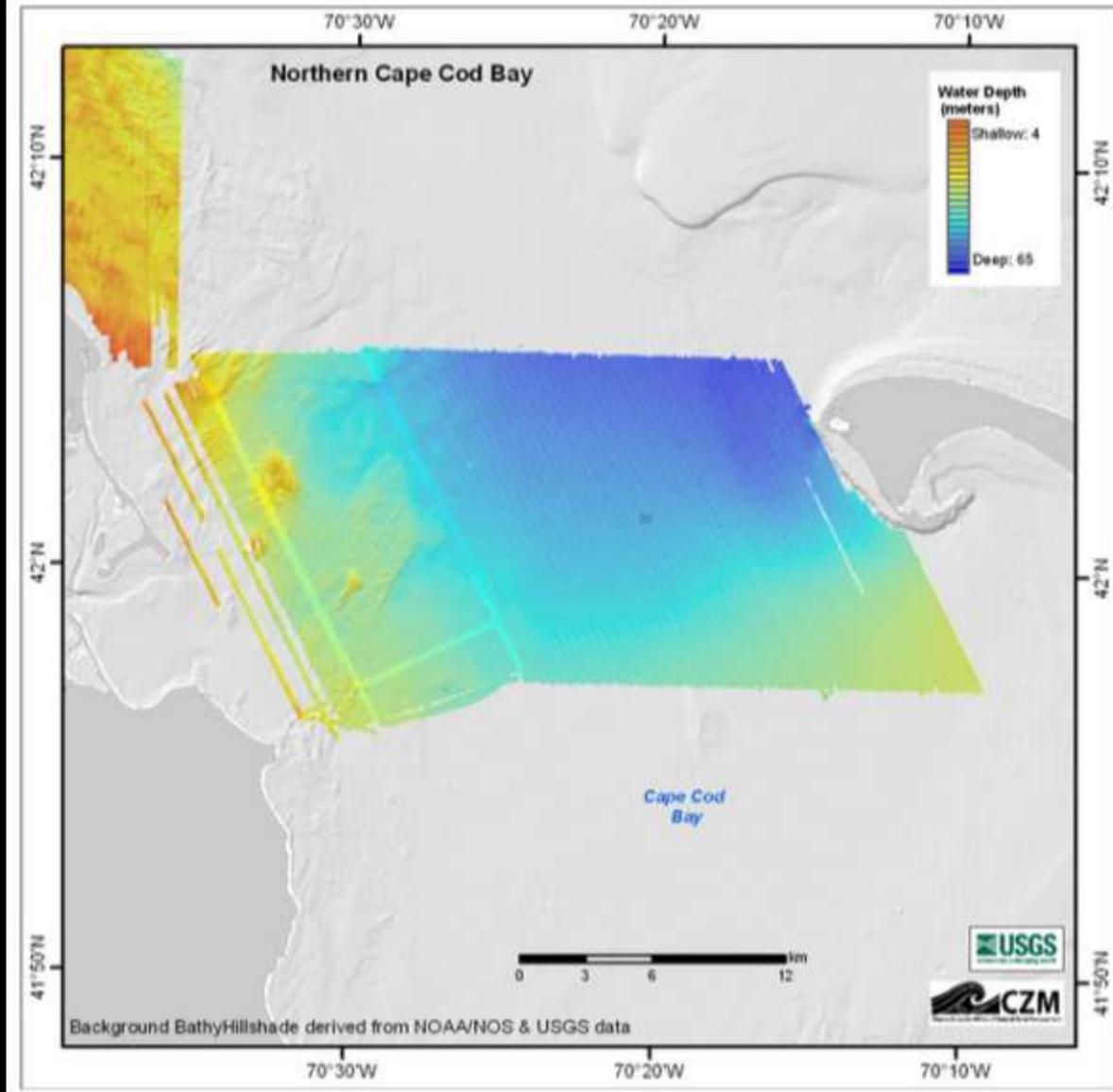


Cape Cod Bay

Cape Cod  
National Seashore

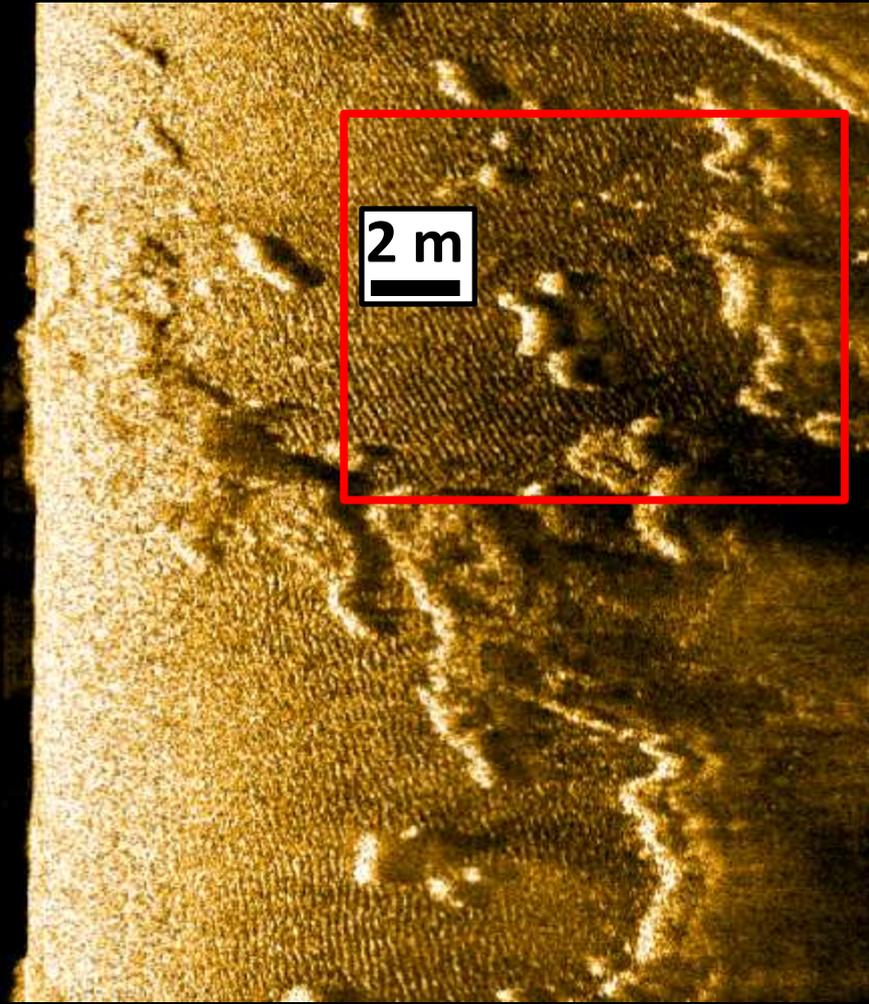
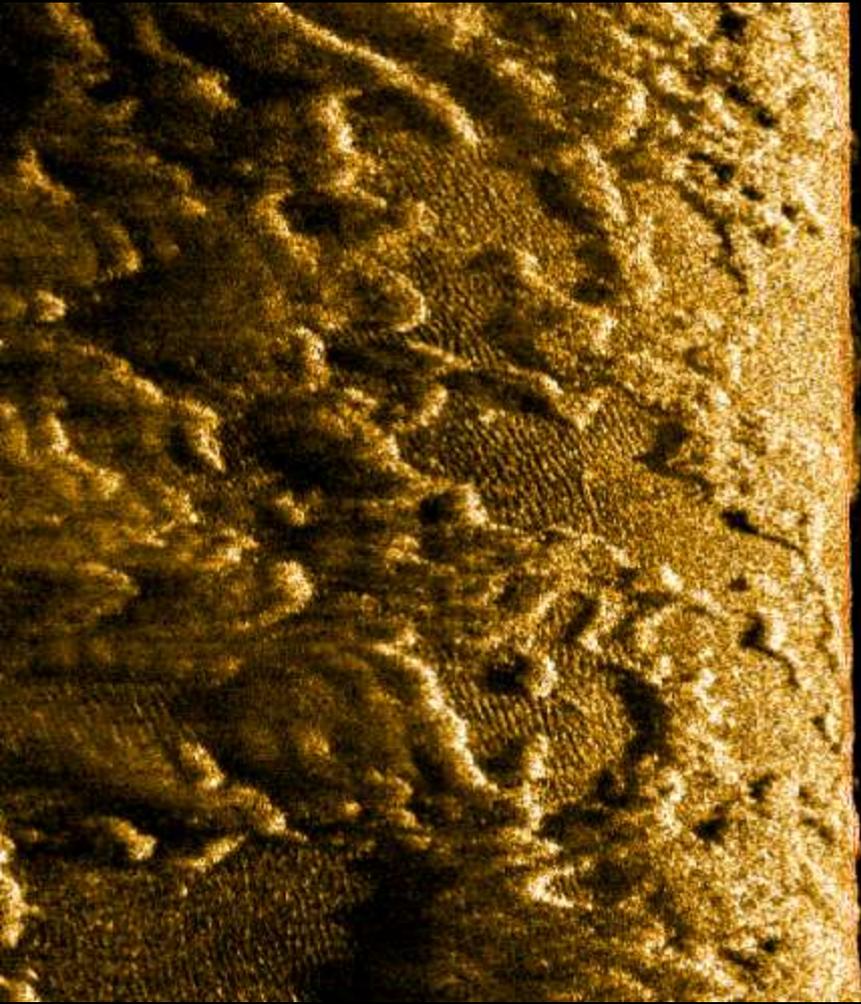
Study Area

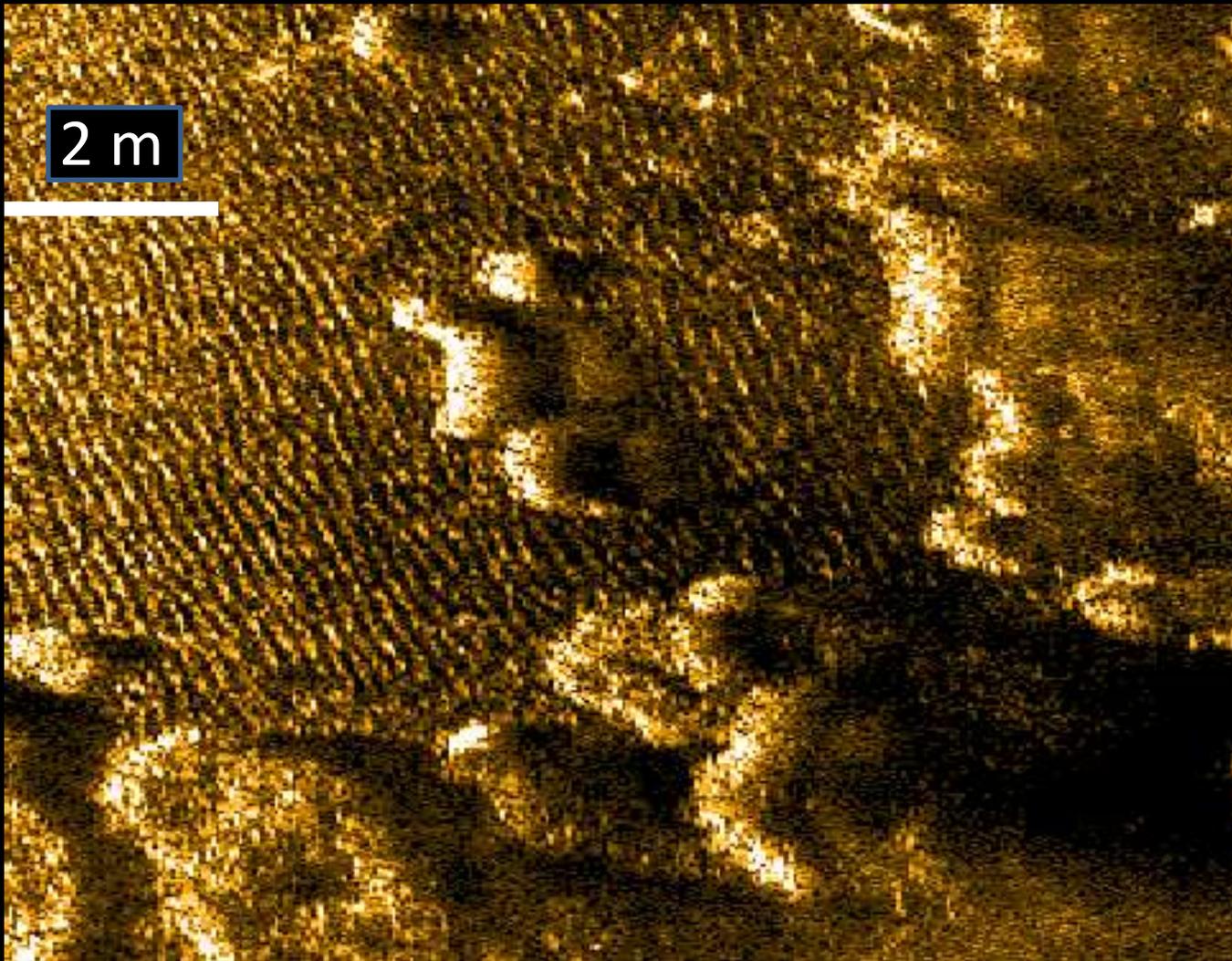


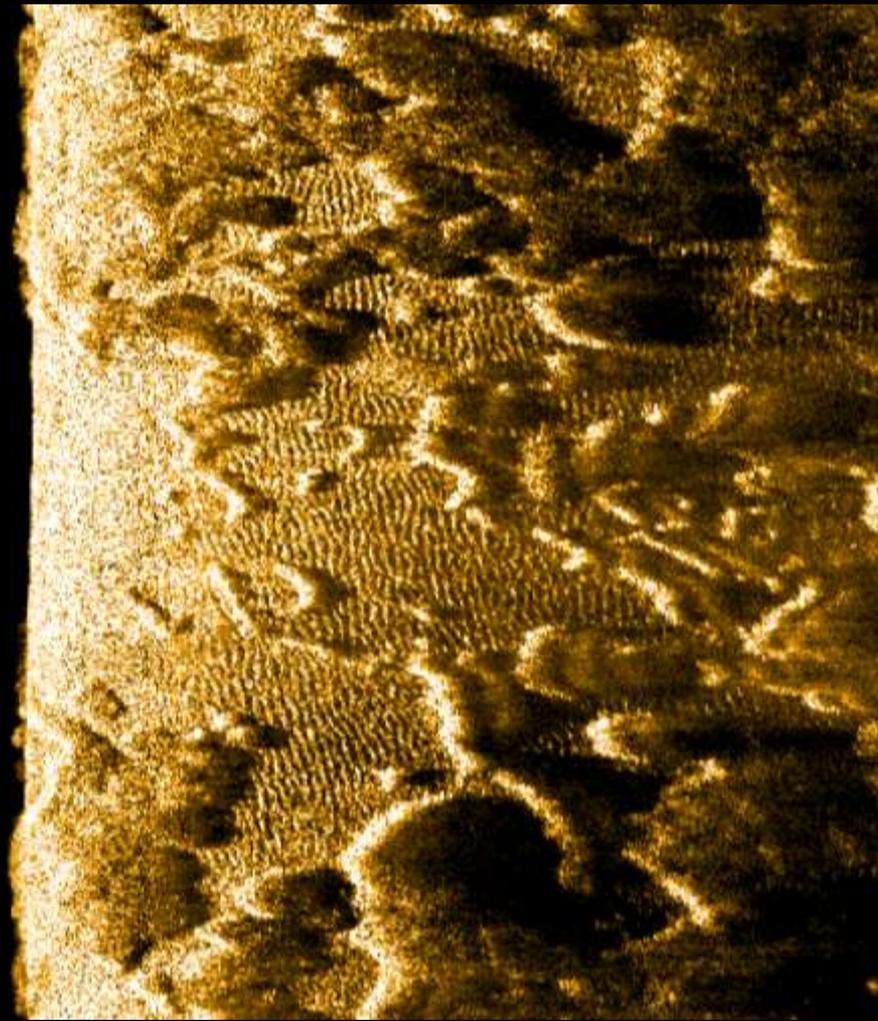
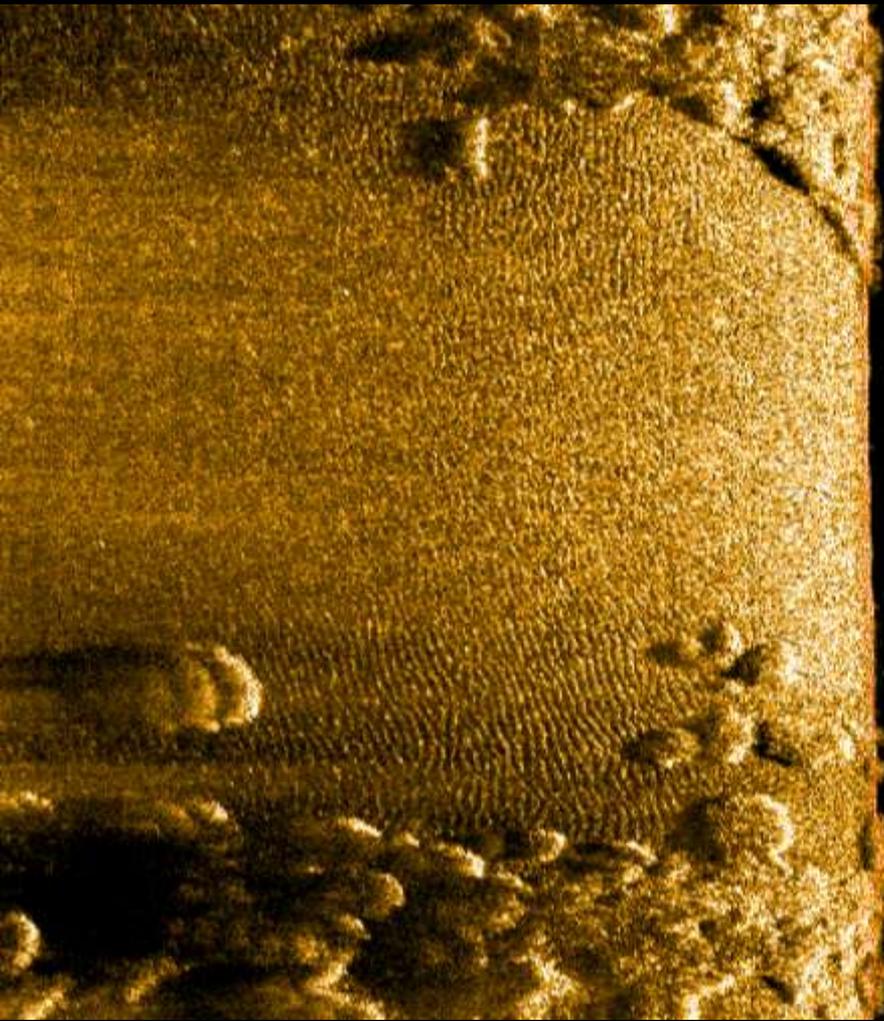


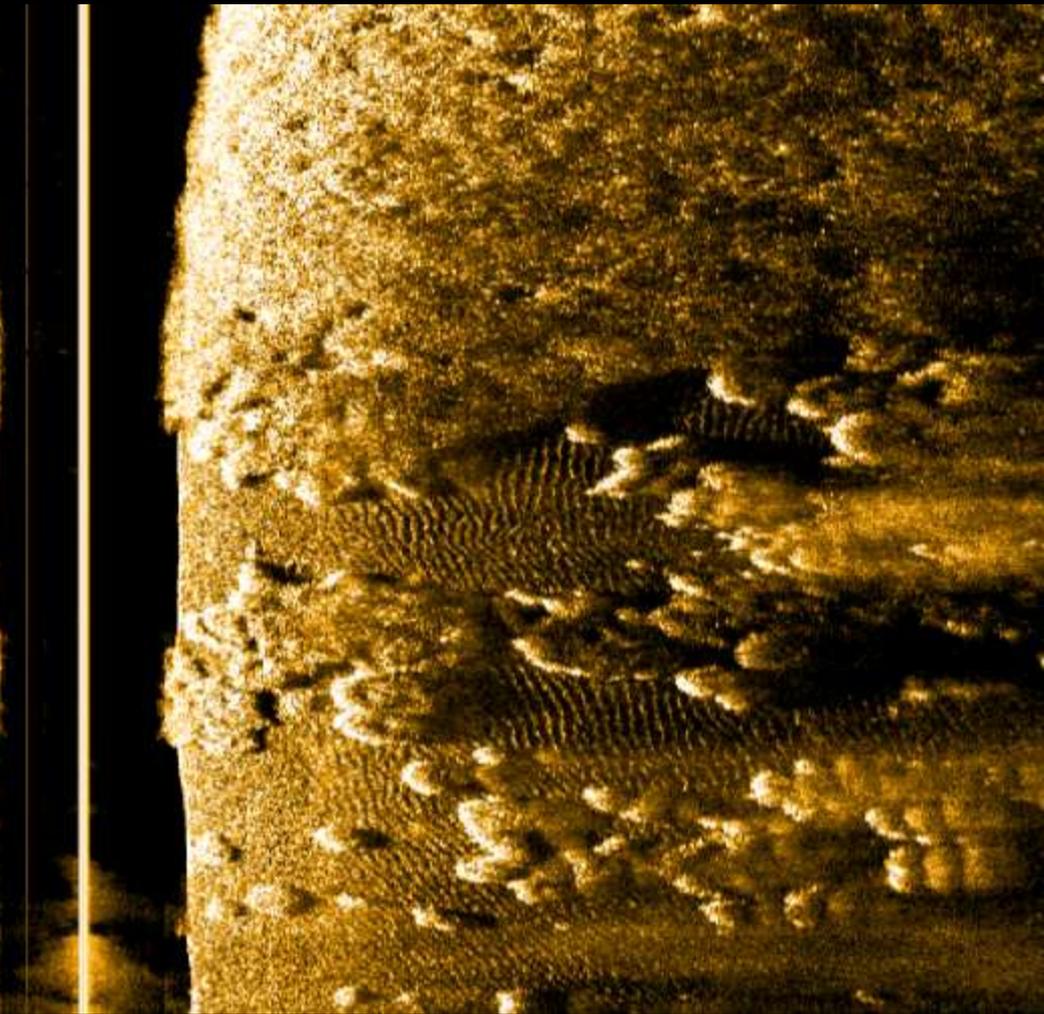
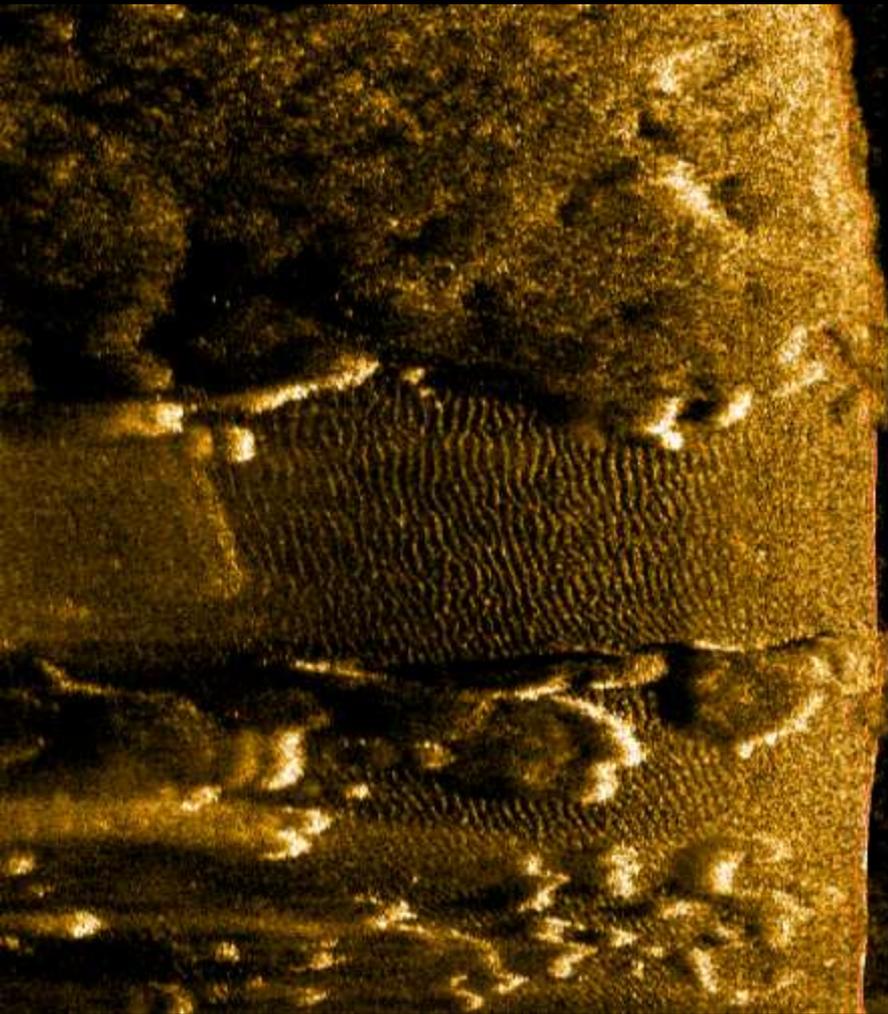


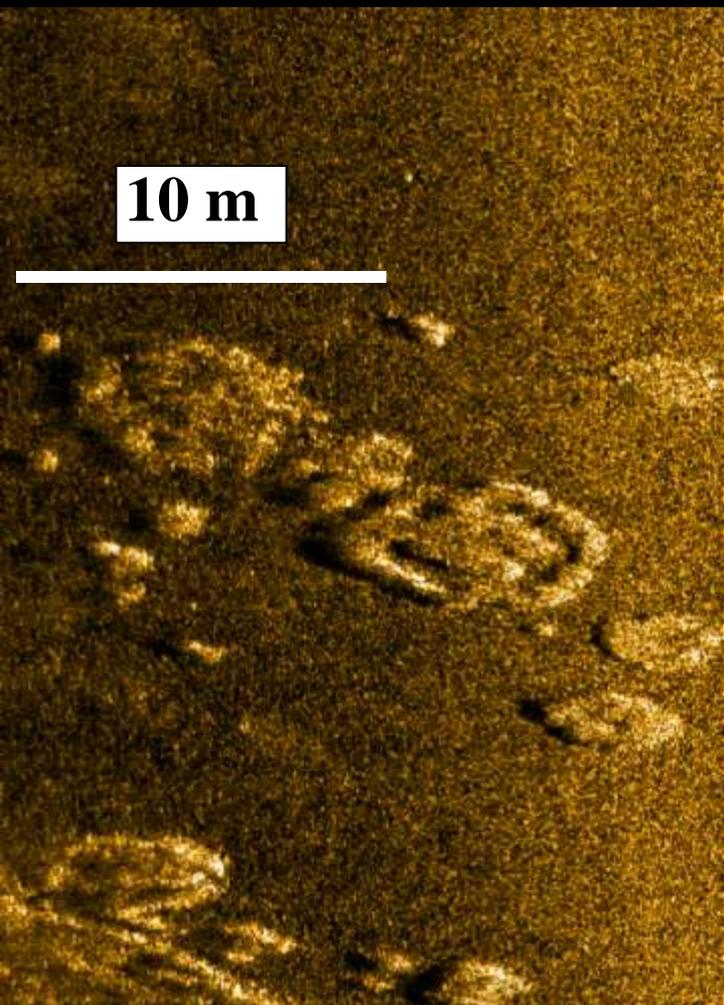
# Coastal Ecosystems

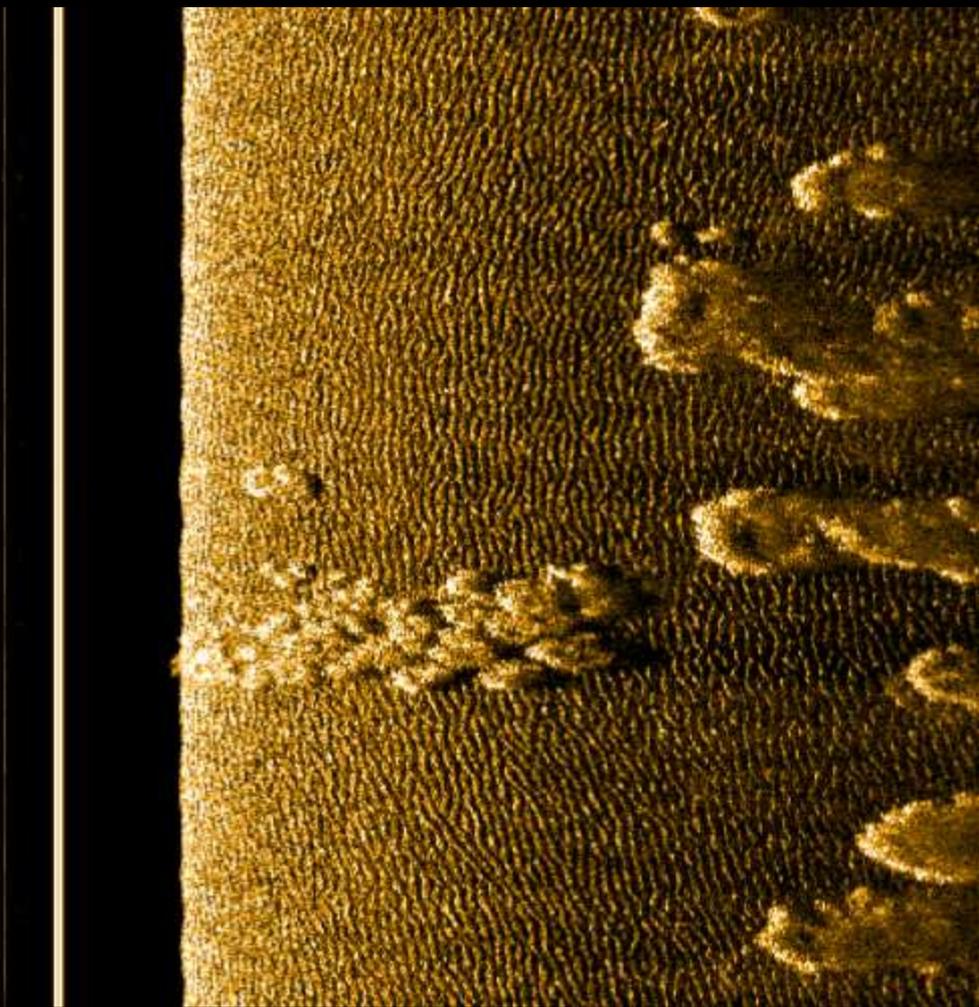
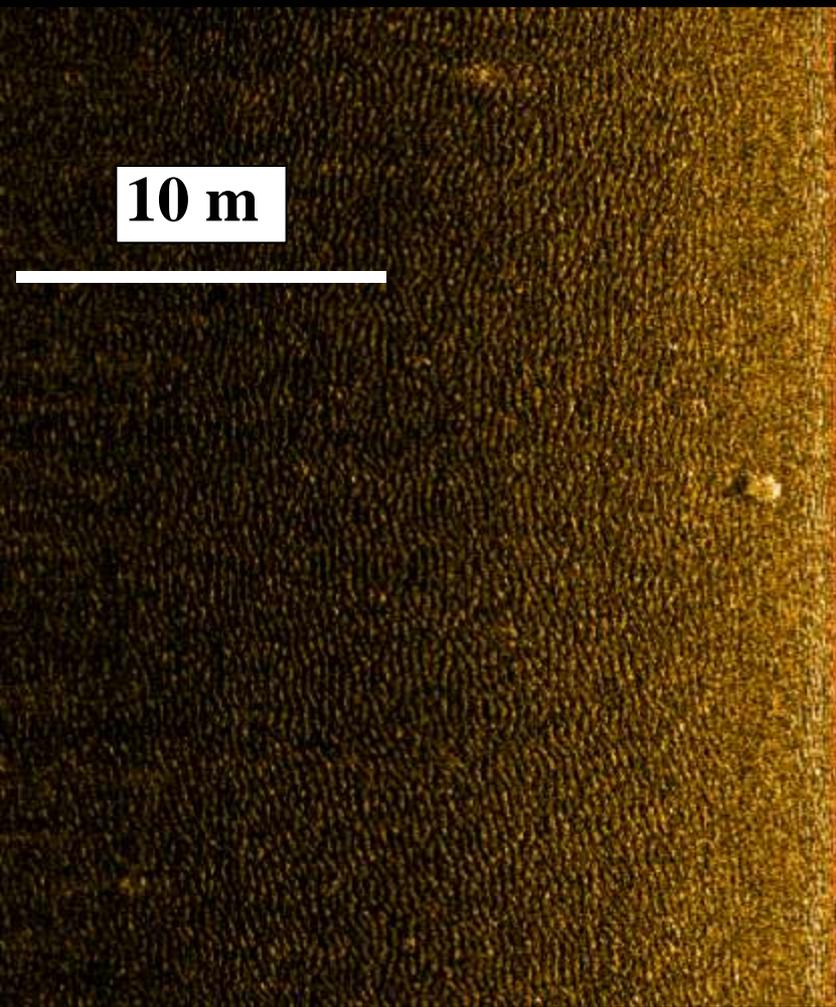


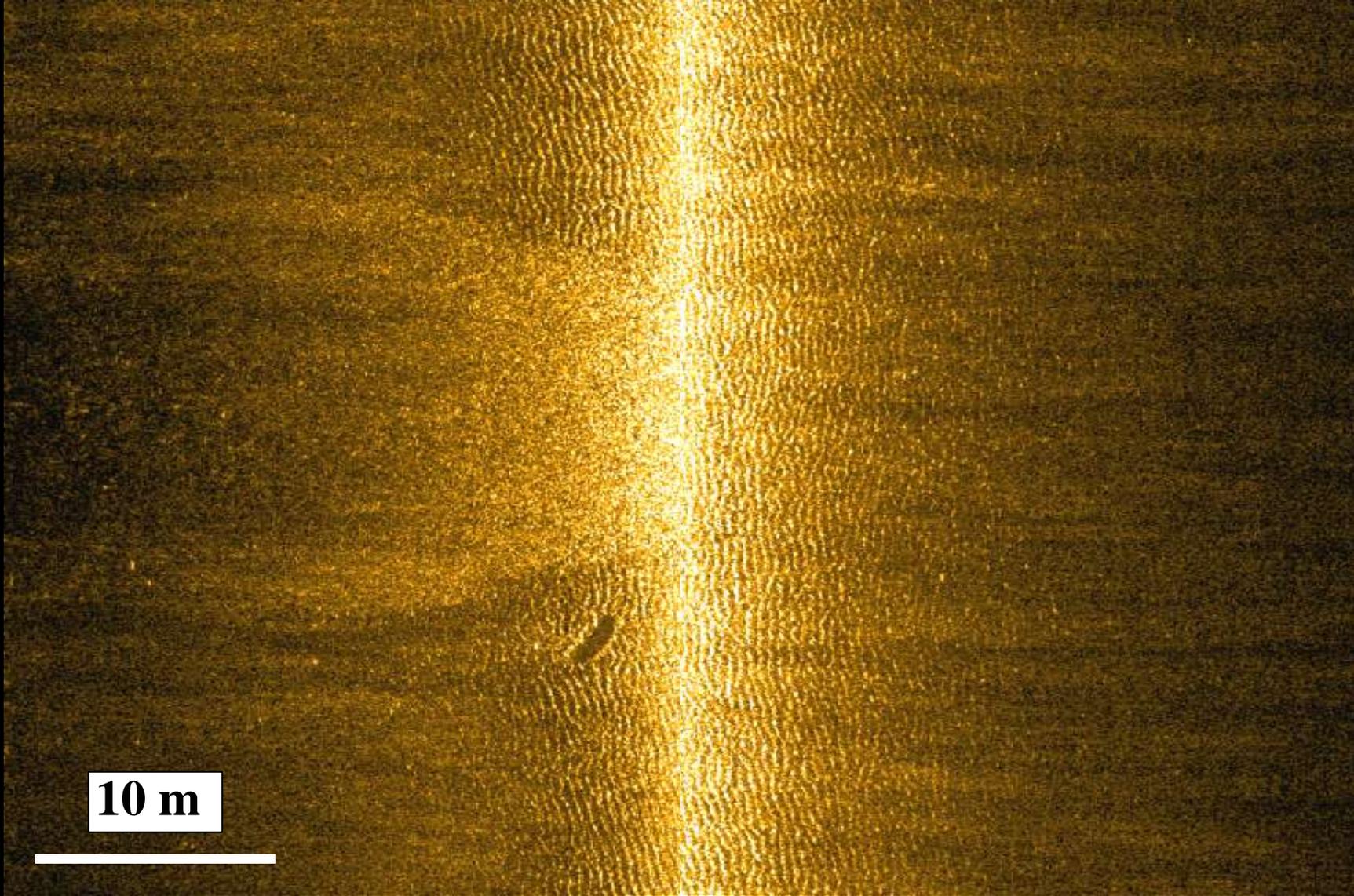






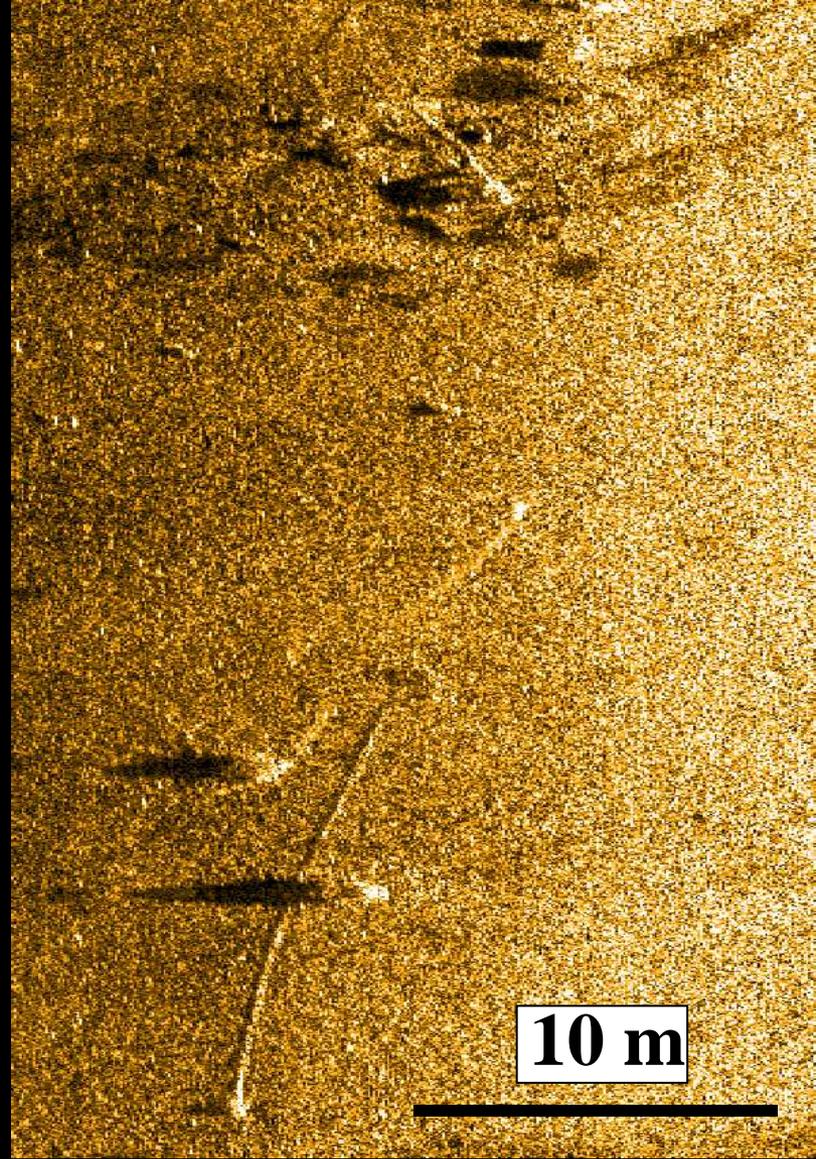
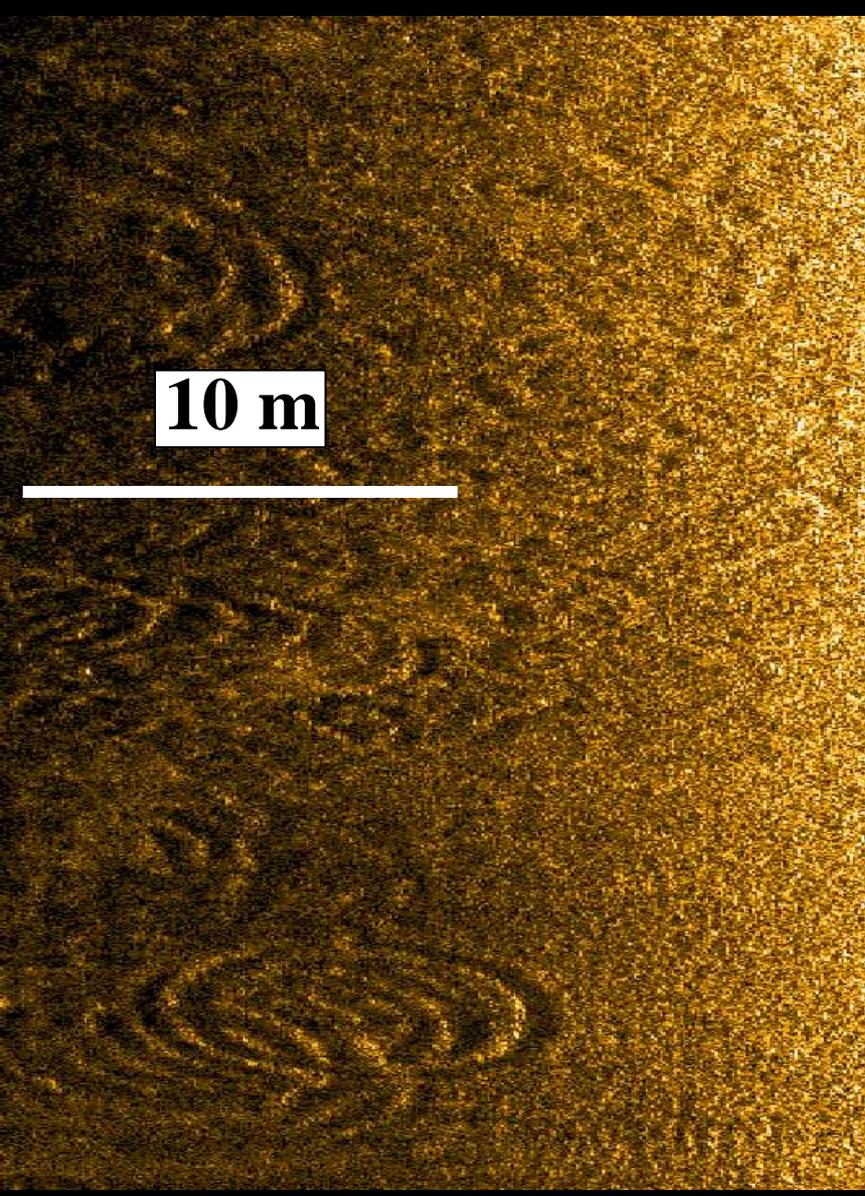




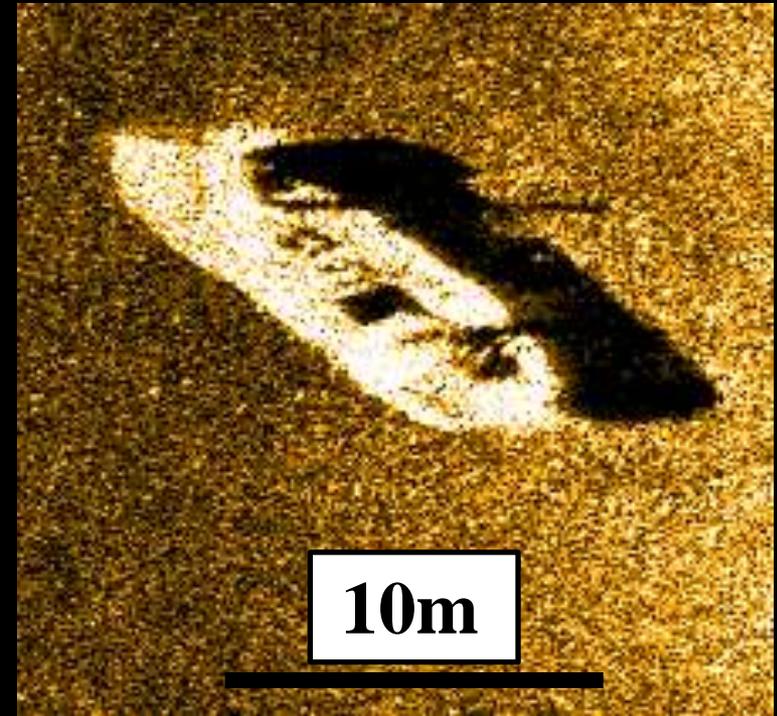


10 m





# Hazards to Navigation



# Preliminary Results

- ~100 km of track lines in 1-5 m
- 10:1 swath to depth (very good 7-8:1)
- Bedforms: ~10 cm spacing
- Uncertainty analyses



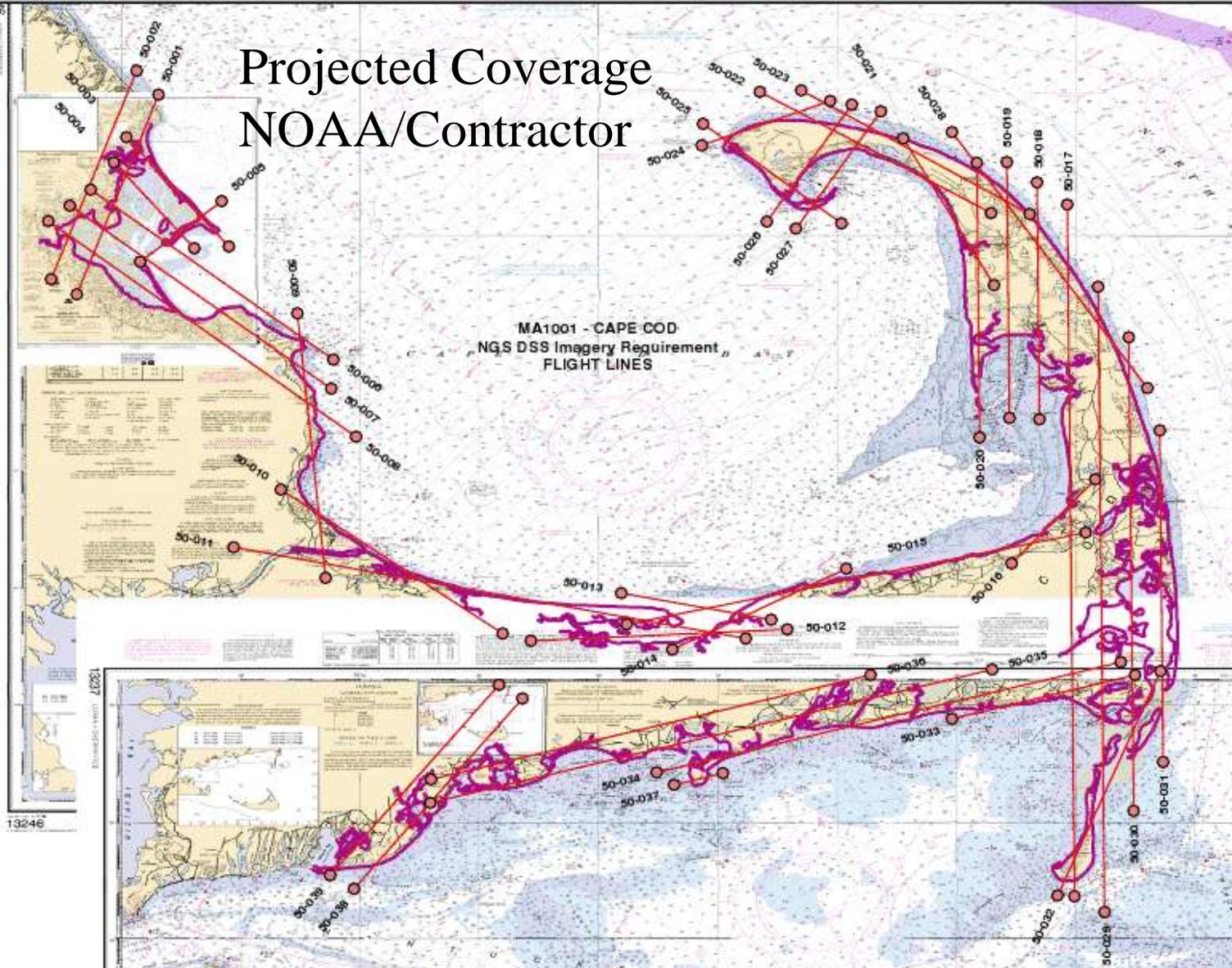
# LIDAR Missions

## Can you have too much data?

- April 2010: USACE: Will be flying RI, MA  
– SHOALS (bathy)
- USGS:  
– EAARL(bathy)
- NCALM, whenever we want(!) likely Late Summer.... (terrestrial)
- NOAA (?)



# Projected Coverage NOAA/Contractor



# Acknowledgements



Massachusetts  
Coastal Zone  
Management



Teledyne  
Benthos



Cape Cod  
National  
Seashore

Questions?



HYPACK  
Inc



Hemisphere  
GPS



Trimble







# Seamless Onshore/Offshore maps

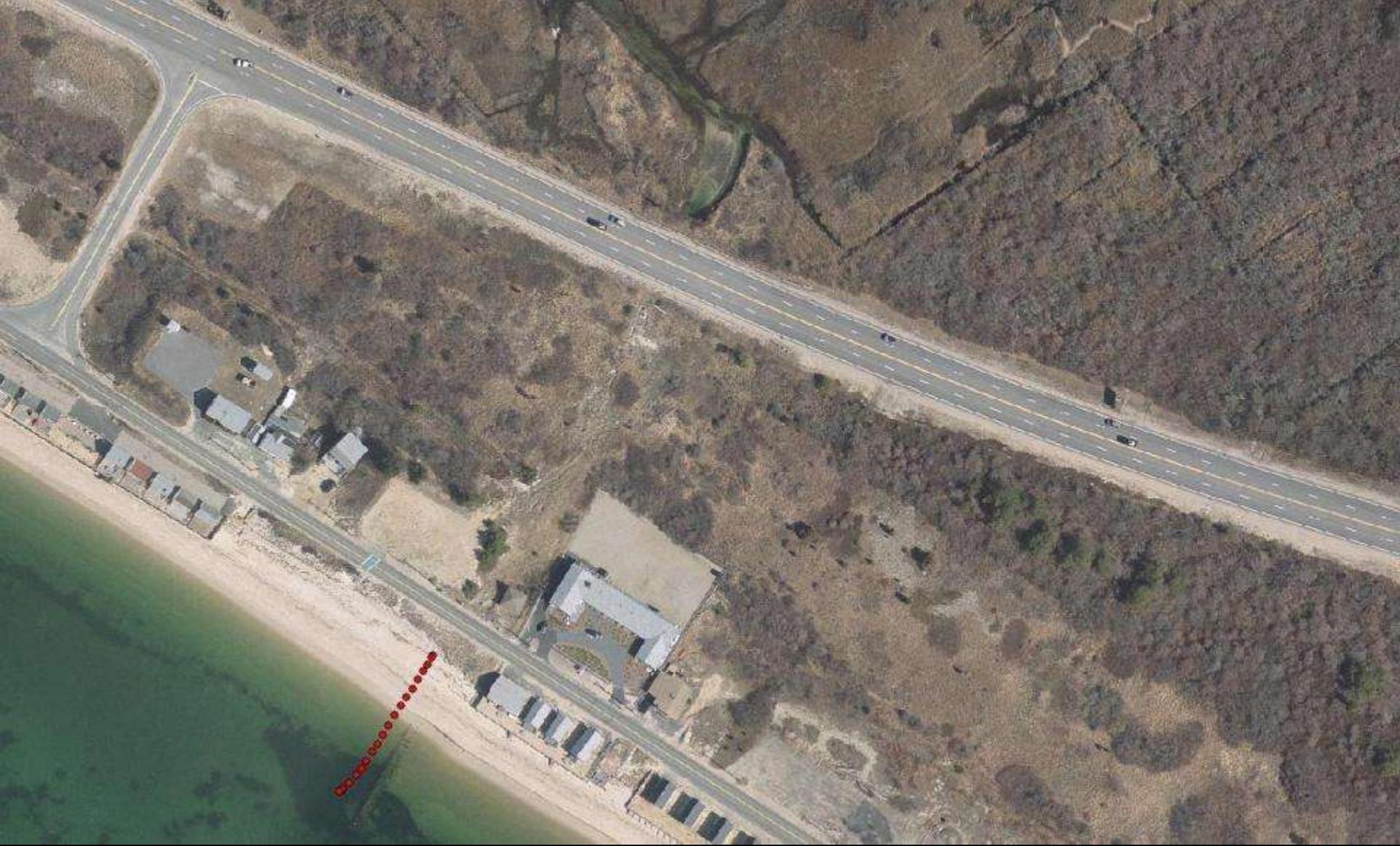


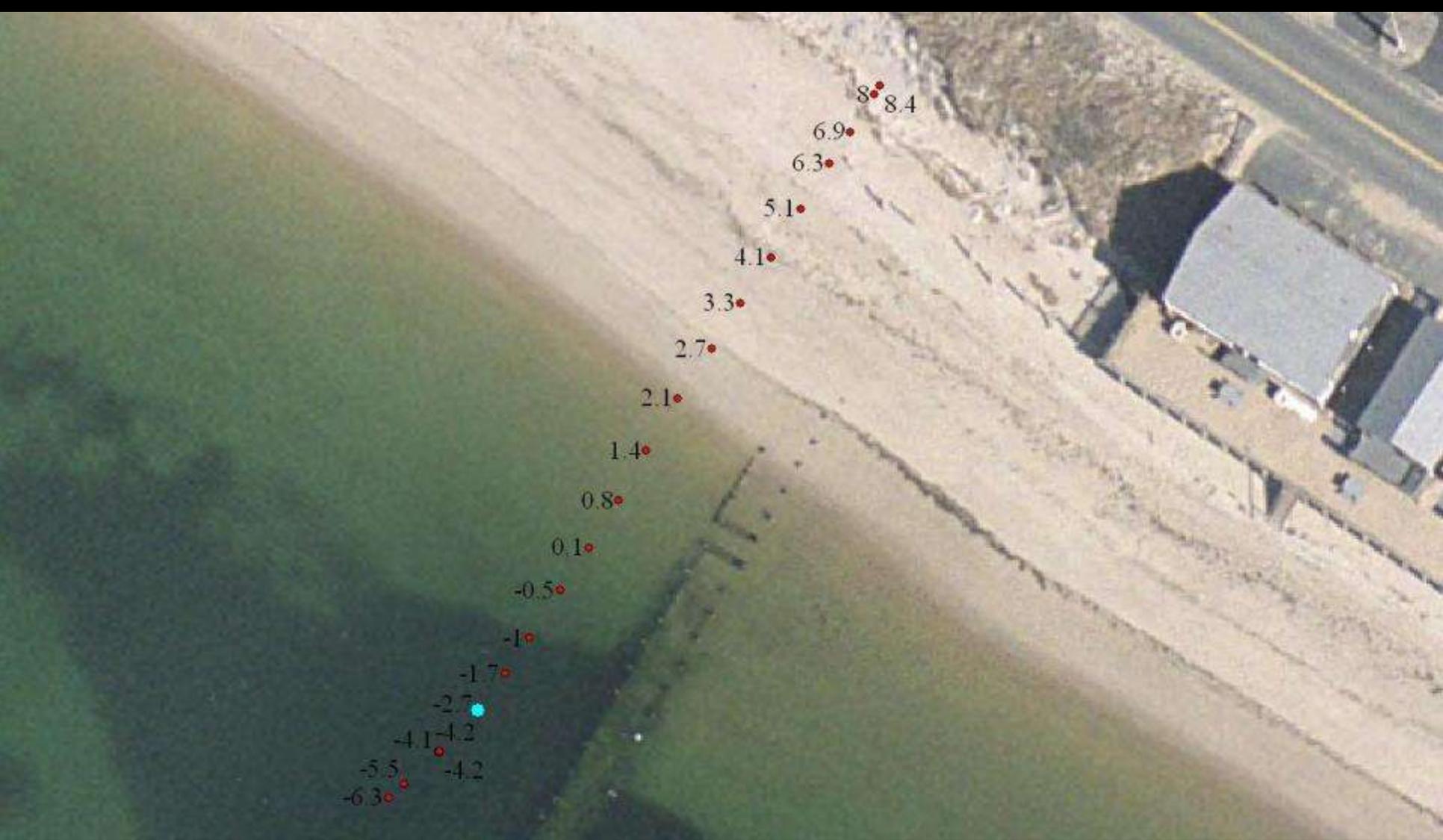


# East Harbor Restoration









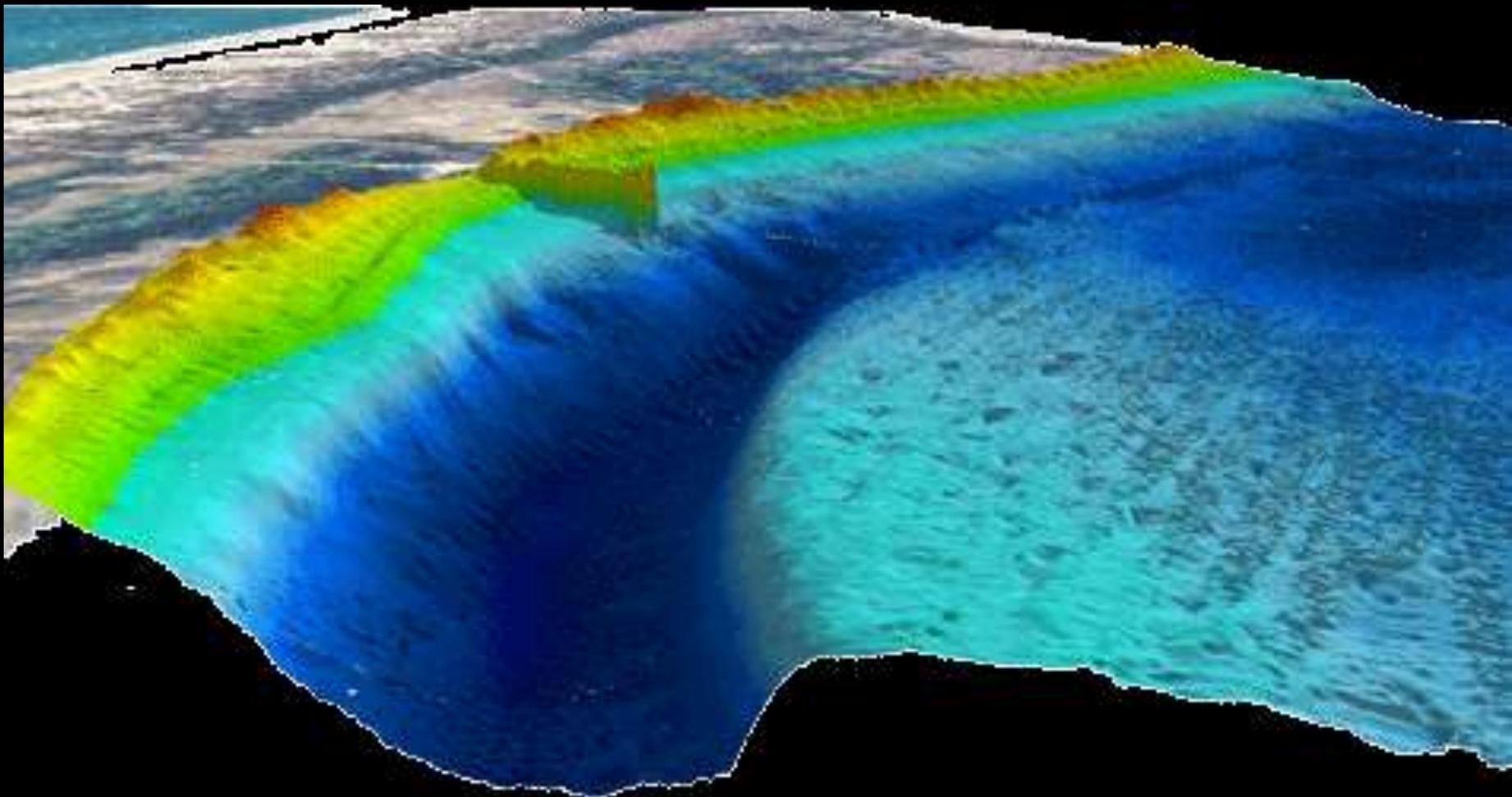




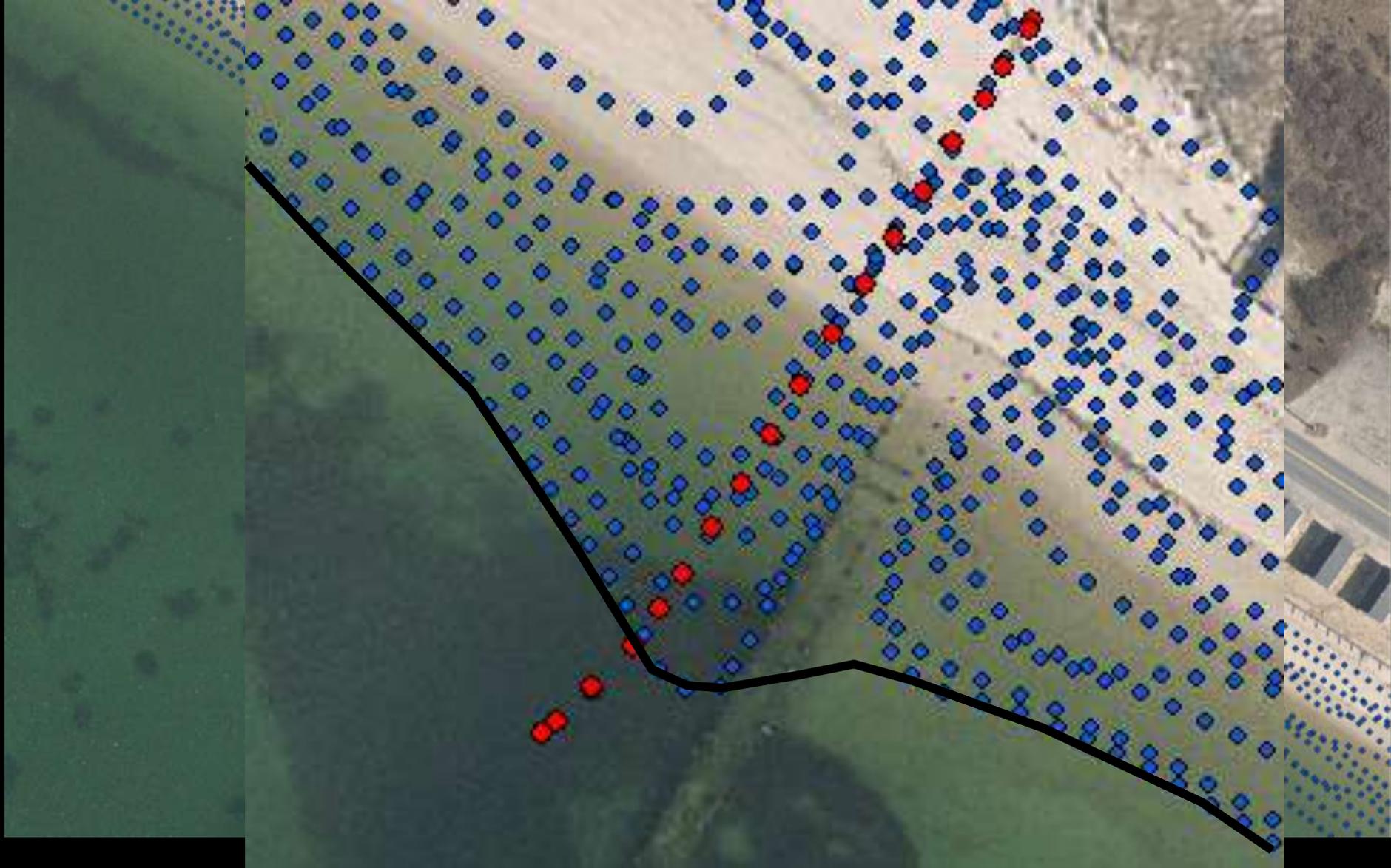


1.40 miles = 2.25km  
Over 14,000 points









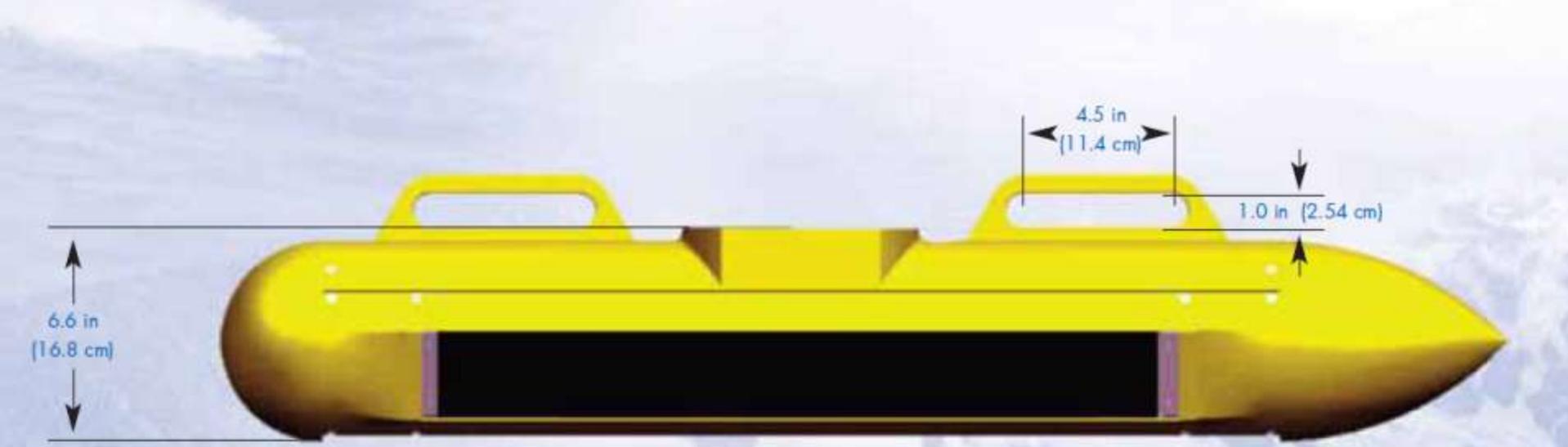
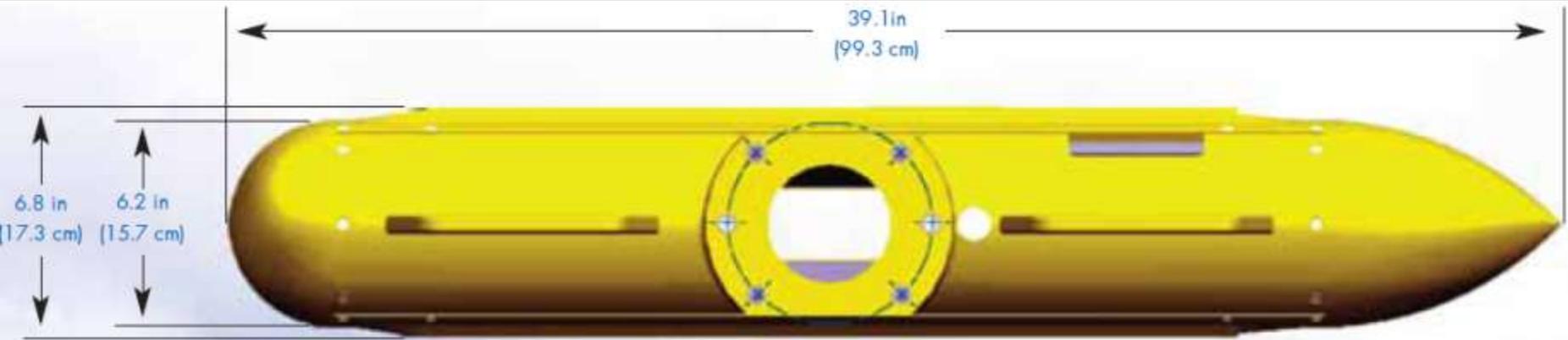
1.40 miles = 2.25km  
Over 14,000 points







# C3D Transducer Pod



# Interferometric vs. Multi-beam: Data Collection

- **MULTI-BEAM ECHO SOUNDERS**
  - transmit and receive beams
  - depth measured in angular increments
- **INTERFEROMETRIC SONAR**
  - phase content of the signal
  - angle of returning wave front
  - phase difference of incoming wave front and wavelength



# To Do List

- Pseudo-sales pitch
- Highlight partnerships
  - State, federal, NGOs...
- Generalize LNG and seafloor mapping fund
- Insert coastal and spatial marine planning
  - Cape Cod Marine Sanctuary?
  - aquaculture
- Focus on nearshore /shallow water
- Mention USACE/CCNS, east harbor and 1930s-1970s bathy
  - We're going out to get them newer bathy
- Get latest USGS/NOAA coverage of Cape Cod Bay
  - Mention NOAA channel realignment in CCB, "Jennifer Lukens mentioned Boston Harbor nav channel realignment yesterday I don't know if she mentioned the CCB one, I was late yesterday morning but did learn to my surprise the Providence has two Marriotts!



# To Do List-02

## NOAA's priorities

Naviagation, commerce, sustainable coastal communities, coastal ecosystems, 'science-service-stewardship'

Communities that can adapt to weather and climate change

Updated bathy : someone mentioned "Trajectory models in shallow water"

